8125

INSTRUCTION BOOK

MODEL 91A RF VOLTMETER

Boonton
~~CUSTOM~~ ELECTRONICS CORPORATION
MORRIS PLAINS, NEW JERSEY

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July 16

1. GENERAL DESCRIPTION

The Model 91A RF Voltmeter is designed to measure radio frequency voltages from .001 to 3 volts over the frequency range of .2 to 400 megacycles. Seven voltage ranges from .003 to 3 volts full scale are provided plus an arbitrary DB scale.

Two probes are supplied with each instrument, one being a general purpose high impedance probe and the other having a 52 ohm input impedance with BNC coaxial fitting and maximum standing wave ratio of 1.10 up to 400 MC. The high impedance probe has a shunt capacitance component of 2.5 mmf at all frequencies within the operating range. The shunt resistance component is a variable factor depending upon both voltage and frequency. An approximation of the shunt resistance component may be obtained from curves in Figure 1 for various combinations of frequency and voltage.

2. CIRCUIT DESCRIPTION

The voltmeter utilizes a full wave crystal rectifier circuit in each probe where the RF voltage is converted to a DC potential which in turn is converted to a 60 cycle carrier frequency by means of a low noise chopper. The 60 cycle carrier is then amplified by means of a high gain feedback amplifier. The amplifier output is rectified and fed into special shaping circuitry ganged to the range switch to provide approximately linear meter response on all ranges.

The probes are designed with a large attenuation at 60 cycles to reduce errors that result when spurious 60 cycle voltages enter the carrier amplifier and mix with the 60 cycle developed by the chopper.

3. OPERATING PROCEDURE

Connect power cord to an AC power source of from 105 to 125 volts 60 cycles and turn power switch to ON position.

Select either the Hi-Z or 52 ohm probe as desired and connect to instrument by means of special two conductor flexible shielded cable supplied with the instrument. Check serial number of probe and see that it is the same as that of the voltmeter being used.

Set RANGE-FULL SCALE switch to appropriate setting for voltage to be measured.

When using the high impedance probe the ground connection must be as short as possible to avoid unnecessary errors at frequencies above 3MC. Any of the eight 3-48 screws near the front of the probe may be used for ground connections. Connection to the high side must also be as short and direct as physically possiblre for accurate results ar high frequencies.

4. PRECAUTIONS

4.1 OVERLOAD EFFECTS

Care should be taken to see that RF voltage exceeding 10 volts are not accidentally applied or permanent damage to the probe crystal diodes may result.

Overloads up to 50/1 can be accommodated on the lower millivolt ranges without serious effect. Excessive overloads such as the application of 3 volts to the .003 volt range will create a temporary charging voltage on the input filter capacitors which apprars as a large residual reading on the .003 range, and requires several minutes before it will completely dissipate itself. Dissipation can be speeded up by setting RANGE switch to 3 volt range.

SPECIFICATIONS

BOONTON ELECTRONICS MODEL 91A RF VOLTMETER

Voltage Range

1 millivolt to 3 volts

Frequency Range

200 kilocycles to 400 megacycles

Accuracy

Range - Full Scale	Accuracy
.01 to 3 volts	5% Full Scale to 200 mc 10% Full Scale above 200 mc
.003 volt	10% Full Scale to 400 mc

Input Impedance

52 Ohm Probe	High Impedance Probe
VSWR 1.10 Max	Cap = 2.5 uuf Shunt Resistance (see curve)

Power Supply

105 to 125 volts, 55-65 c.p.s 30 watts

Tubes

One 12AX7; one 6AU6; one 12AT7; one 0A2; one 6X4

Dimentions

7" wide, 11" high, 9" deep

Maximum probe extension 33inches from instrument.

Weight

13 lbs.

4.2 60 CYCLE PICK-UP

When measuring low level RF voltages precautions should be taken to avoid the possibility of erroneous readings resulting from superimposed 60 or 120 cycle pick-up voltages leaking through the probe filter and chopper to the carrier amplifier. The presence of such pick-up may be detected by noting any change in reading when the power cord connection is reversed. If the source of pick-up cannot be eliminated the average of the two readings may be used.

A typical example of this condition would be when aptempting to measure a 10 MV RF signal across the plate impedance of an RF amplifier having a 10 MV 120 cycle ripple in the B supply. Although the probe filter will reduce the AC ripple voltage to approximately one millivott it can still cause considerable error when measuring a 10 millivolt RF signal.

5. MAINTANCE

5.1 PERIODIC CHECKING

The Model 91 A is designed to give long periods of service without maintenance when operated in accordance with these instructions. It is recommended however, that the instrument be periodically checked at some low frequency between 200 KC and 3 megacycles to insure against errors resulting from excessive deterioration of amplifier tubes or power supply. Tube aging effects will be most apparent on the .003 volt range as less feedback is used in the carrier amplifier on this range.

5.2 FIELD REPLACEMENTS AND ADJUSTMENTS

The following components may be replaced in the field if necessary, providing certain requirements are met as outlined below.

TYPE	FUNCTION	SPECIAL REQUIREMENTS
6X4	Rectifier	None
0A2	Regulator	145-155 volts
12AX7	Amplifier	Low noise Non-Microphonic Amperex recommended but not essential
6AU6	Amplifier	None
12AT7	Amplifier	High GM recommended Select if necessary

If the heater rectifier output is less than 11 volts it should be replaced with a Federal No. 1016 Selenium Rectifier or equivalent. A new rectifier should supply from 11.5 to 13 volts.

The chopper may be replaced whenever necessary by a Siemens Arnold type A-11 Chopper.

If, after replacement of tubes, the voltmeter calibration appears to be uniformly off by a small percentage on ranges from .01 to 3 volts it may be adjusted within tolerance by means of the R8 adjustment located at the top rear center of the amplifier chassis. The full scale adjustment for the .003 volt range is R1 on the side of the amplifier chassis amd may be reset if necessary.

C4	Capacitor, ceramic	.05mf. ±20%
C5	Capacitor, ceramic	.05mf. ±20%
C6	Capacitor, Mylar	.022mf. ±20% 200v
C7	Capacitor, metallized paper	2.0mf. ±10% 200v
C8	Capacitor, electrolytic(20mf./25v) Part of 40-20-20mf./300-300v. C.D.XC0732	
C9	Capacitor, ceramic	.05mf. ±20%
C10	Capacitor, electrolytic(20mf. 25v) See C5	
C11	Capacitor, electrolytic(40mf. 300v) See C5	
C12	Capacitor, Mylar	.022mf. ±20% 200v. Good-All 621M22302
C13	Capacitor, ceramic	.1mf. ±20%
C14	Capacitor, Mylar	.022mf. ±20% 200v, Good-All 621M302
C15	Capacitor, Mylar	.015mf. ±10% 200v. Good-All 621M15392
C16	Capacitor, metallized paper	1.0mf. 200v
C17	Capacitor, metallized paper	1.0mf. 200v
C18	Capacitor, ceramic	.001mf.
C19	Capacitor, ceramic	.001mf.
C20	Capacitor, ceramic	.001mf.
C21	Capacitor, ceramic	.001mf.
C22	Capacitor, ceramic	.001mf.
C23	Capacitor, ceramic	.001mf.
C24	Capacitor, electrolytic	40mf. 450v
C25	Capacitor, electrolytic	1000mf. 15v
C26	Capacitor, Mylar	.022mf. ±20% 200v. Good-All 621M22302

CH1	Chopper	Stevens-Arnold A 11
D1	Diode	1N128
D2	Diode, Selected	
D3	Diode, Selected	
D4	Diode, Selected	
D5	Diode, Selected	
D6	Diode, Selected	
D7	Diode	1N128
F1	Fuse	1A.
L1	Choke, filter	Stancor C-1707
M1	Meter	Special

(All deposited carbon resistors are ±1% 1/4W; all composition resistors are ±5% 1/2W, unless otherwise noted.)

R1	Resistor, deposited carbon	1 meg.
R2	Resistor, deposited carbon	1 meg.
R3	Resistor, deposited carbon	80K ohms
R4	Resistor, deposited carbon	80K ohms
R5	Resistor, deposited carbon	8.9K ohms
R6	Resistor, deposited carbon	8.9K ohms
R7	Resistor, deposited carbon	1K ohms
R8	Resistor, deposited carbon	1K ohms
R9	Resistor, deposited carbon	190 ohms
R10	Resistor, deposited carbon	190 ohms
R11	Resistor, deposited carbon	90 ohms
R12	Resistor, deposited carbon	90 ohms

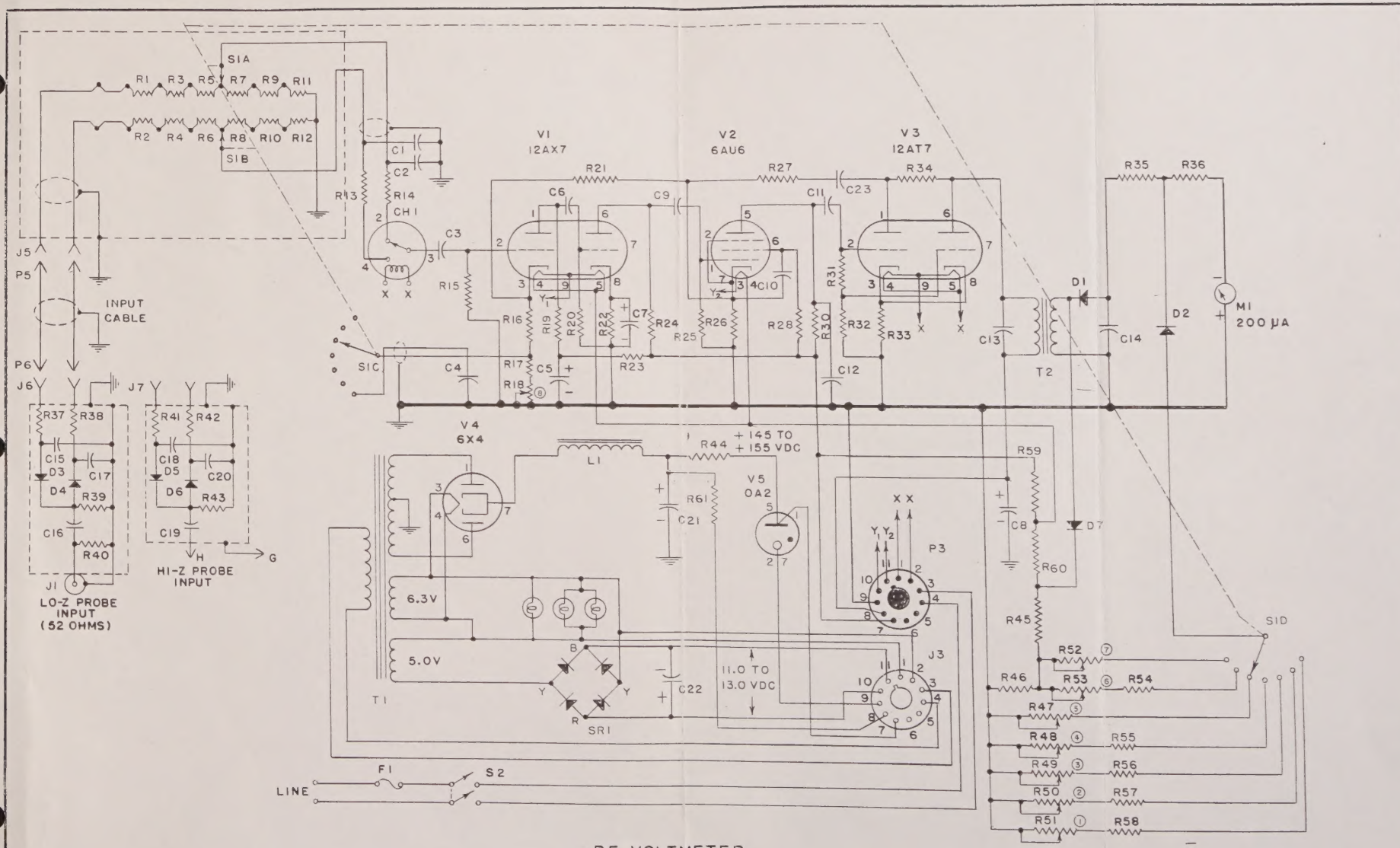
R13	Resistor, composition	47K ohms
R14	Resistor, composition	47K ohms
R15	Resistor, composition	2.2 meg.
R16	Resistor, composition	1K ohms
R17	Resistor, deposited carbon	10K ohms
R18	Resistor, variable	5K ohms ±20%
R19	Resistor, composition	1 meg.
R20	Resistor, composition	2.2 meg.
R21	Resistor, deposited carbon	500K ohms
R22	Resistor, composition	6.8K ohms
R23	Resistor, composition	47K ohms
R24	Resistor, composition	470K ohms
R25	Resistor, composition	1 meg.
R26	Resistor, deposited carbon	2.25K ohms
R27	Resistor, deposited carbon	500K ohms
R28	Resistor, composition	1 meg.
R29	Not used	
R30	Resistor, composition	470K ohms
R31	Resistor, composition	22 ohms
R32	Resistor, composition	1 meg.
R33	Resistor, composition	100 ohms
R34	Resistor, composition	22 ohms
R35	Resistor, deposited carbon	7.5K ohms
R36	Resistor, deposited carbon	3K ohms
R37	Resistor, composition	10K ohms
R38	Resistor, composition	10K ohms
R39	Resistor, deposited carbon	15K ohms
R40	Resistor, deposited carbon	52 ohms

R41	Resistor, composition	1.5K ohms
R42	Resistor, composition	10K ohms
R43	Resistor, deposited carbon	240K ohms
R44	Resistor, power wire-wound	7.5K ohms ±10% 10W
R45	Resistor, composition	3.3K ohms
R46	Resistor, composition	470 ohms
R47	Resistor, variable composition	50K ohms ±20%
R48	Resistor, variable composition	1K ohms ±20%
R49	Resistor, variable composition	1K ohms ±20%
R50	Resistor, variable composition	1K ohms ±20%
R51	Resistor, variable composition	1K ohms ±20%
R52	Resistor, variable composition	250K ohms ±20%
R53	Resistor, variable composition	250K ohms ±20%
R54	Resistor, composition	~~330K ohms~~ 20K (changed to 20K 4-11- IN ORDER TO OBTAIN A MORE FLEXIBLE ADJ-
R55	Resistor, composition	1K ohms
R56	Resistor, composition	470 ohms
R57	Resistor, composition	470 ohms
R58	Resistor, composition	1K ohms
R59	Resistor, composition	33K ohms ±5% 1W
R60	Resistor, composition	15K ohms
R61	Resistor, composition	5.6K ohms ±5% 2W
SR1	Rectifier, Selenium	I.T.T. 1016
S1	Switch, special	
S2	Switch, toggle, DPST	
T1	Transformer, power	Stancor P8406
T2	Transformer, A.F.	Thordarson 20A19

ITTF 23 TEC

A10 A30 A1 A3 A1

A13



RF VOLTMETER
MODEL 91-A & 91-B
SCHEMATIC DIAGRAM 9100
REV. A,B,C

BOONTON ELECTRONICS CORP.

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